

Alcohol Interventions in a Trauma Center as a Means of Reducing the Risk of Injury Recurrence

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Objective

Alcoholism is the leading risk factor for injury. The authors hypothesized that providing brief alcohol interventions as a routine component of trauma care would significantly reduce alcohol consumption and would decrease the rate of trauma recidivism.

Methods

This study was a randomized, prospective controlled trial in a level 1 trauma center. Patients were screened using a blood alcohol concentration, gamma glutamyl transpeptidase level, and short Michigan Alcoholism Screening Test (SMAST). Those with positive results were randomized to a brief intervention or control group. Reinjury was detected by a computerized search of emergency department and statewide hospital discharge records, and 6- and 12-month interviews were conducted to assess alcohol use.

Results

A total of 2524 patients were screened; 1153 screened positive (46%). Three hundred sixty-six were randomized to the

intervention group, and 396 to controls. At 12 months, the intervention group decreased alcohol consumption by 21.8 ± 3.7 drinks per week; in the control group, the decrease was 6.7 ± 5.8 ($p = 0.03$). The reduction was most apparent in patients with mild to moderate alcohol problems (SMAST score 3 to 8); they had 21.6 ± 4.2 fewer drinks per week, compared to an increase of 2.3 ± 8.3 drinks per week in controls ($p < 0.01$). There was a 47% reduction in injuries requiring either emergency department or trauma center admission (hazard ratio 0.53, 95% confidence interval 0.26 to 1.07, $p = 0.07$) and a 48% reduction in injuries requiring hospital admission (3 years follow-up).

Conclusion

Alcohol interventions are associated with a reduction in alcohol intake and a reduced risk of trauma recidivism. Given the prevalence of alcohol problems in trauma centers, screening, intervention, and counseling for alcohol problems should be routine.

Regional trauma centers were developed 25 years ago in response to studies showing that 40% of deaths from injuries in the United States could have been prevented if the patient had been treated in a facility with special expertise in treating injuries.¹ With the advent of regional trauma systems, the preventable death rate has now been reduced to

<2% to 3%; therefore, future decreases in the trauma death rate are not likely to occur as a result of improvements in the delivery of care.² Nearly half of all trauma deaths occur at the scene; these also are not responsive to improvements in care.^{3,4} Future significant decreases in the death rate for injuries, therefore, depend primarily on progress in injury prevention.

By far the most common underlying causes of injuries in the United States are alcohol abuse and dependence.^{5,6} Studies repeatedly demonstrate that approximately 50% of patients admitted to a trauma center are under the influence of alcohol, and the mean blood alcohol concentration of such patients is 187 mg/dl, nearly twice the legal level for

Presented at the 119th Annual Meeting of the American Surgical Association, April 15-17, 1999, Hyatt Regency Hotel, San Diego, California. Supported by NIH/NIAAA grant RO1-AA09045.

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Accepted for publication April 1999.

driving in most states.^{7,8} When questionnaires such as the Short Michigan Alcohol Screening Test (SMAST) are administered to trauma patients, as many as 44% test positive for chronic alcohol abuse.^{9,10} Alcoholism plays such a significant role in trauma that efforts to reduce the risk of injuries or their recurrence are unlikely to be successful if it remains untreated.

In the past several years, there has been increasing interest in the use of brief, motivational interventions designed to assist patients with alcohol abuse or mild symptoms of alcohol dependency to reduce or eliminate their alcohol consumption. A series of randomized trials conducted in a variety of health care settings have demonstrated a significant reduction in alcohol consumption with the use of brief interventions in appropriately targeted populations.^{11–13}

Addressing alcohol problems in trauma centers is currently not routine. Only 19% of trauma centers routinely measure blood alcohol concentrations on injured patients, and <15% formally assess patients for an alcohol use disorder using screening questionnaires; the provision of alcohol counseling as a routine component of trauma care is even rarer.¹⁴ Preliminary data suggest that a recent life-threatening injury increases the receptivity of patients toward alcohol counseling.^{15–19} We hypothesized that alcohol interventions, coupled with trauma center admission, would significantly reduce alcohol consumption and decrease the risk of reinjury. We report the first prospective, randomized, controlled trial on the use of alcohol interventions in a level 1 trauma center as a means of injury prevention.

METHODS

Screening and Enrollment

The study was conducted at Harborview Medical Center, University of Washington, between October 1994 and November 1996. The study population consisted of patients who were admitted to the trauma center for treatment of an injury. Patients were excluded if they were younger than 18 years old, were discharged within 24 hours, did not speak English, had a traumatic brain injury that did not resolve by discharge, died during hospitalization, were not residents of Washington state, were homeless, had severe psychiatric problems, or were discharged to a long-term care facility.

Injured patients underwent routine screening for an alcohol problem with measurement of blood alcohol concentration (BAC) and serum gamma glutamyl transpeptidase (GGT). After resolution of any mental status abnormalities, the SMAST was also administered.²⁰ Screening was considered positive if one of the following five conditions was met: BAC ≥ 100 mg/dl; SMAST score ≥ 3 ; BAC of 1 to 99 mg/dl and SMAST score of 1 or 2; BAC of 1 to 99 and GGT above normal; or SMAST score of 1 or 2 and GGT above normal.

Patients who screened positive were asked to give consent for participation in a study to assess their outcome from

trauma by means of follow-up interviews at 6 and 12 months and for use of their medical records and other databases. Consent was not obtained for randomization into an intervention or control group, nor were the patients told that they were taking part in a study to reduce alcohol consumption. Such a procedure would result in bias, because intractable patients would likely refuse to participate, and patients who did participate would be sensitized to the fact that their drinking would be monitored. After consent for follow-up, patients were randomized to an intervention or control group using a computer-generated code. The study was approved by the University of Washington Institutional Review Committee.

Baseline Evaluation

A detailed baseline evaluation was performed on all intervention patients and on a random sample (45%) of controls. This was conducted by a trained research assistant and consisted of administration of the Alcohol Use Disorders Identification Test (AUDIT), the alcohol section of the NIMH Diagnostic Interview Schedule (DIS) form III-R, the Short Alcohol Dependence Data (SADD) questionnaire, and selected fields of the Addiction Severity Index.^{21–24} The number of drinks consumed was converted to standard ethanol units (4 oz wine = 12 oz beer or 1 oz distilled spirits). Injury data were obtained from the Harborview Medical Center Trauma Registry. Injury severity was assessed using the Injury Severity Score.²⁵

Intervention

The intervention, which was conducted on or near the day of hospital discharge, consisted of a single motivational interview with a psychologist trained in the use of brief interventions.^{26–29} The basic elements of the intervention consisted of personalized feedback comparing the patient's drinking quantity and frequency to national norms; the level of intoxication at admission and its relation to common effects and injury risk found at different BAC levels; negative social consequences of alcohol derived from the SMAST and AUDIT; negative physical consequences as reflected by abnormal laboratory values; and the level of alcohol dependence derived from the SADD and DIS-III-R. The interventionist discussed these findings with respect to increased risk for negative consequences, particularly subsequent trauma.

A focus was placed on the patient's assuming personal responsibility for reducing drinking to decrease his or her level of risk. A menu of strategies was provided to assist patients in their attempts to change, including a list of treatment resources and self-help (12-step) groups in the community. The interventionist presented this information in a respectful, empathic manner meant to increase the level of personal motivation for change and to increase the patient's sense of personal efficacy and optimism. The session

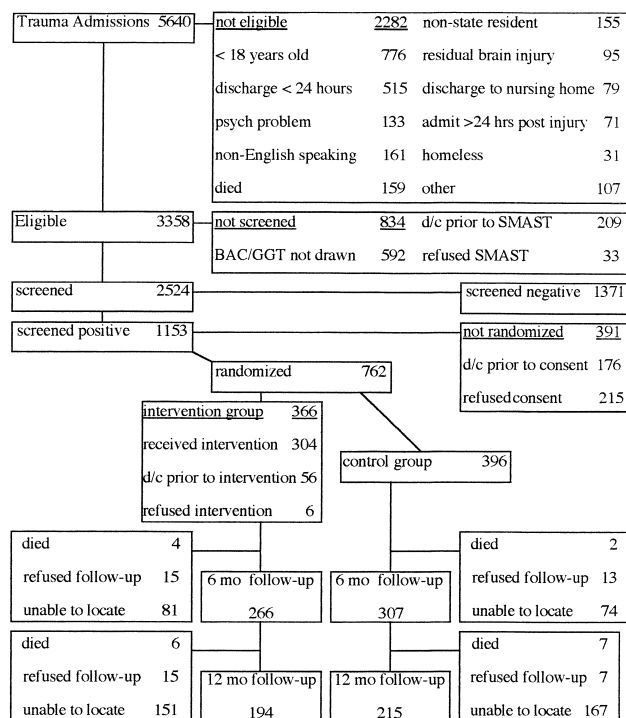


Figure 1. Flow of participants in the trial.

lasted approximately 30 minutes, and a handwritten follow-up letter summarizing the session was sent to the patient 1 month later. The specific details of the intervention have been described in prior publications from our group.^{5,30}

The only interaction between research staff and control patients was screening with the SMAST, obtaining consent, and administering the baseline assessments to the 45% randomly selected sample. Control patients who requested help for a drinking problem on their own were assisted in obtaining it.

Study Outcomes

The principal study outcome measure was trauma recurrence after hospital discharge. This was assessed using a computerized database of emergency department records to detect return of King County resident study patients to Harborview Medical Center with a new injury requiring either emergency department treatment or trauma center readmission. Return visits occurring within 15 days of hospital discharge were presumed to result from complications of the original injury and were not included. Charts of patients who were seen after 15 days were reviewed by persons unaware of the patient's group assignment to verify that a new injury had occurred. To detect new injuries requiring inpatient hospital treatment throughout the entire state, a computerized database of all hospital discharges maintained by the State of Washington Department of Health was reviewed. The use of computerized databases

enabled us to obtain objective follow-up information on the primary study outcome variable on all study patients except those who moved out of state.

Secondary outcomes obtained from statewide databases included citations for driving under the influence of alcohol and other traffic violations, which were detected by searching records of the Washington State Department of Licensing. Criminal arrests of patients living in King County were detected by searching King County Police Department records. Changes in amount of alcohol use were assessed by means of patient interviews conducted at 6 and 12 months. This involved repeat administration of components of the instruments used for baseline assessment, formatted to appear as a generalized questionnaire to assess the patient's

Table 1. SCREENING AND BASELINE CHARACTERISTICS OF INTERVENTION AND CONTROL GROUP PATIENTS*

Screening Results	Intervention Group (n = 366)	Control Group (n = 396)
Mean BAC (mg/dl)	153 (SD 122)	151 (SD 119)
0	20.8%	19.0%
1–99	14.8%	14.1%
100–199	25.6%	24.8%
>200	38.8%	2.1%
SMAST score		
0–2	26.7%	27.3%
3–8	53.4%	57.7%
9–13	19.8%	15.1%
GGT abnormal	29.8%	24.4%
Baseline Characteristics		
Age	35.4 (SD 11.4)	36.8 (SD 12.3)
Male	82.5%	81.6%
Mechanism of injury		
Fall	15.1%	19.5%
Motor vehicle	37.9%	30.0%
Pedestrian/bike	7.1%	7.2%
Gunshot	15.9%	16.4%
wound/penetrating		
Blunt	17.3%	18.5%
Other	6.6%	8.5%
Injury Severity Score	11.07 (SD 8.01)	10.59 (SD 7.67)
Injury intent		
Intentional	30.9%	29.9%
Unintentional	69.1%	70.1%
Married	15.3%	13.8%
Education		
High school or less	53.3%	50.8%
Some college or more	46.7%	49.2%
Employed	52.3%	47.5%
Concurrent drug use	47.1%	52.8%
Prior alcohol counseling	46.6%	49.1%
Prior drug abuse counseling	23.6%	16.7%

* Screening results and injury data provided for all patients. Marital status, education, employment, and prior substance abuse history are reported for all intervention patients and for control patients randomized to receive a baseline assessment. None of the differences between intervention and control patients were significant.

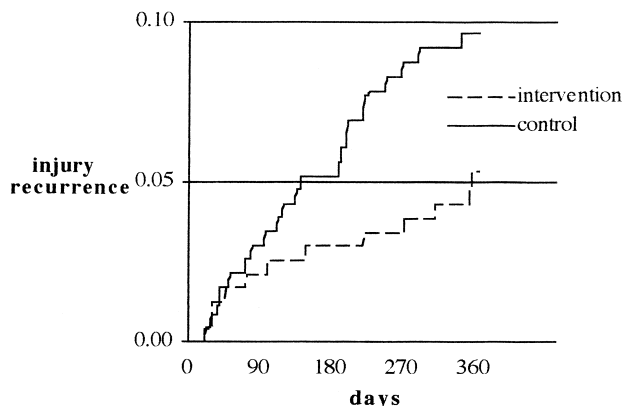


Figure 2. Risk of repeat injury requiring treatment in the Harborview Medical Center Emergency Department or admission to the trauma center. The analysis is for King County residents at 1 year follow-up and controls for gender, SMAST score, age, injury intent, and injury severity score (hazard ratio 0.53, 95% CI 0.26-1.07).

outcome from trauma. An additional measure, the Treatment Services Review (TSR), was modified to use a 6- and 12-month window and was administered to assess the extent of alcohol treatment services (if any) received since discharge.³⁰ All follow-up interviews were conducted by a trained research assistant who was blinded to patient group assignment.

Data Analysis

In designing the study, we assumed that the intervention effect would vary by level of alcohol problem severity and other key predictor variables. These probable effect modifiers were determined *a priori* and used for analysis of subpopulations and as control factors. Kaplan-Meier survival curves representing time to reinjury were assessed using the log-rank test and the Cox proportional hazards model.³¹ Hospital readmissions, traffic violations, and arrests were analyzed as dichotomous dependent variables while controlling for the predetermined covariates in a logistic regression model. Continuous outcomes such as reduction in alcohol intake and scores on outcome questionnaires were compared using t tests and the Mann-Whitney test. The prospectively chosen covariates were included in these analyses using multiple logistic regression. All analyses were performed on an intention-to-treat basis.

RESULTS

There were 5640 trauma patients admitted during the 2-year enrollment period. Of these, 3358 patients were eligible for the study. Screening was completed on 2524 eligible patients (75%, Fig. 1). Only 33 patients refused to take the SMAST. The remaining 801 patients were not screened because they were discharged before administration of the SMAST ($n = 209$) or an admission BAC was not obtained despite protocol ($n = 592$). Compared with eligi-

ble patients not screened, those who were screened were more likely to be male, white, younger, and injured in a motor vehicle crash, to have an intentional injury, or to be hospitalized for >2 days.

Screening was positive in 1153 screened patients (46%). Most patients screened positive by meeting one or both of the first two screening criteria. Patients who screened positive were more likely to be male, 25 to 44 years of age, and nonwhite and to have penetrating trauma or intentional injuries than patients who screened negative. Consent was obtained on 762 patients (66%) who screened positive. The refusal rate was only 18.6% ($n = 215$). The remaining 176 patients screened positive by blood alcohol criteria but were admitted and discharged over the weekend, when study staff were not available to enroll patients. There were no differences in BAC, GGT, or SMAST scores between patients enrolled and not enrolled in the study who screened positive.

A total of 366 patients were randomized to the intervention group, and 396 were randomized to the control group. Screening and demographic characteristics of the patients in both groups were similar (Table 1). The intervention was completed in 83% of patients allocated to receive it ($n = 304$). Fifty-six patients gave consent and were randomized but were discharged before being seen by the interventionist. Only six patients (1.6%) refused the intervention. Follow-up interviews were completed on 266 (73%) and 194 (53%) intervention patients at 6 and 12 months and 307 (76%) and 215 (54%) control patients, respectively.

There was no difference in baseline alcohol problem severity as determined by mean admission BAC, GGT, and SMAST score for intervention and control group patients who were lost to follow-up and those who completed 12-month interviews. Follow-up was performed by face-to-face interview in 69% of cases and by telephone in the remaining 31% of patients who lived outside King County or were unable to return to Harborview Medical Center.

There was a 47% reduction in new injuries requiring either treatment in the emergency department or readmission to the trauma service in the intervention group com-

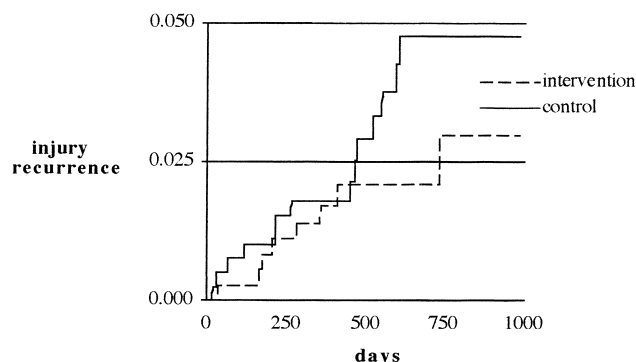


Figure 3. Risk of injury resulting in hospital readmission in Washington State. Follow-up duration was up to three years. Analysis controls for gender, SMAST score, age, injury intent, and injury severity score (hazard ratio 0.52, 95% confidence interval 0.21 to 1.29).

Table 2. CHANGES IN MEAN WEEKLY ALCOHOL INTAKE IN PATIENTS WITH INTERMEDIATE SMAST SCORES

	Baseline to 6 Months			6 Months to 12 Months			Baseline to 12 Months		
	IG	CG	p Value	IG	CG	p Value	IG	CG	p Value
	[Mean (SE)]	[Mean (SE)]		[Mean (SE)]	[Mean (SE)]		[Mean (SE)]	[Mean (SE)]	
Overall	-17.9 (4.5)	-14.1 (4.2)	0.50	-5.9 (2.4)	7.0 (4.2)	0.01	-21.6 (4.2)	2.3 (8.3)	<0.01
Male	-17.5 (4.8)	-13.4 (5.0)	0.60	-5.3 (2.5)	7.9 (4.8)	0.02	-23.1 (5.0)	6.9 (10.1)	<0.01
Female	-20.1 (12.7)	-16.7 (7.6)	0.84	-8.8 (6.9)	1.7 (6.9)	0.29	-14.7 (3.9)	-14.7 (9.9)	1.00
No prior alcohol Rx	-15.8 (5.8)	-9.3 (4.8)	0.46	-2.0 (3.1)	21.4 (13.3)	0.02	-16.3 (3.2)	16.0 (14.9)	<0.01
Prior alcohol Rx	-24.0 (7.7)	-20.0 (6.9)	0.73	-9.2 (3.9)	1.1 (4.1)	0.09	-32.0 (9.0)	-12.5 (5.4)	0.15

IG, intervention group; CG, control group; Rx, treatment.

* The analysis based on prior alcohol treatment history includes only those controls who underwent a baseline assessment.

pared with controls, after controlling for the covariates SMAST score, gender, age, injury severity, and injury intent (hazard ratio 0.53, 95% confidence interval 0.26 to 1.07, $p = 0.07$), as shown in Figure 2. There was a similar reduction (48%) in inpatient hospital readmissions for treatment of a new injury in intervention group patients with up to 3 years follow-up, as determined by analysis of the statewide hospital discharge database (hazard ratio 0.52, 95% confidence interval 0.21 to 1.29, Fig. 3).

The reduction in trauma recidivism was accompanied by a significant reduction in ethanol intake in intervention group patients compared with controls. At the 12-month follow-up, the patients in the intervention group decreased their weekly alcohol consumption by 21.8 ± 3.7 standard drinks; the control group patients decreased their intake by 6.7 ± 5.8 drinks per week ($p = 0.03$). There were no differences in the death rate (2.7% in the intervention group, 2.3% in controls).

The difference in alcohol intake was most apparent in patients with mild to moderate alcohol problems as determined by the SMAST. There was no detectable benefit in patients with a negative SMAST score (score 0 to 2) who entered the study solely on the basis of an intoxicating BAC. There was also no benefit in patients with very high SMAST scores (9 to 13, associated with severe dependence), whereas patients with intermediate scores (3 to 8) reduced their drinking by 21.6 ± 4.2 drinks per week, compared with an increase of 2.3 ± 8.3 drinks per week in controls ($p < 0.01$; Table 2). Most of the patients in the study had a low to intermediate SMAST score (83%). There was a reduction in ethanol intake in both intervention and control patients at 6-month follow-up; control patients subsequently increased their alcohol intake back to the baseline value, whereas intervention group patients continued to decrease their intake (Fig. 4).

Analysis of subpopulations defined *a priori* as likely to respond poorly to the intervention paradoxically showed significant intervention benefits in unmarried and in unemployed patients. Each of these factors is considered a poor prognostic sign. Employed patients and those with social support (e.g., married) did not show a benefit, as demonstrated in Table 3; closer analysis indicates that the lack of an apparent benefit in married and/or employed patients was because there was a reduction in drinking after injury alone in control group patients with these attributes. This is consistent with an intervention effect of the injury itself in more stable patients and suggests that the intervention benefited patients who most needed it. The only negative predictor of intervention response was prior alcohol treatment. This suggests that the effect of injury plus brief intervention alone is insufficient for patients with more chronic disease.

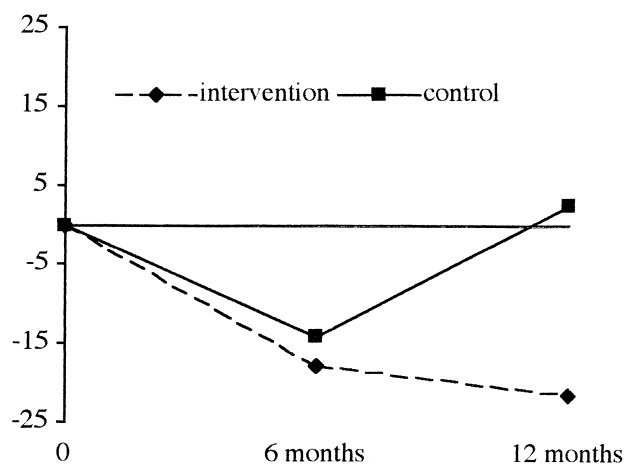


Figure 4. Changes in alcohol intake in mean number of standard drinks per week during follow-up in patients with a SMAST score of 3 to 8 ($p < 0.01$).

Table 3. EFFECT OF PATIENT CHARACTERISTICS ON TREATMENT, REGARDLESS OF SMAST SCORE*

Injury type	Baseline to 6 Months			6 Months to 12 Months			Baseline to 12 Months		
	IG [Mean (SE)]	CG [Mean (SE)]	p Value	IG [Mean (SE)]	CG [Mean (SE)]	p Value	IG [Mean (SE)]	CG [Mean (SE)]	p Value
Injury Type									
Intentional	-3.6 (8.0)	-20.7 (5.8)	0.12	-12.5 (7.6)	11.8 (7.7)	0.03	-21.1 (6.2)	2.2 (17.9)	0.13
Unintentional	-24.6 (5.0)	-11.5 (4.6)	0.10	1.2 (3.5)	3.0 (2.8)	0.69	-22.3 (4.6)	-10.2 (4.4)	0.12
Marital Status									
Single/divorced/widowed	-18.5 (4.8)	-14.9 (4.1)	0.62	-3.2 (3.9)	7.4 (5.1)	0.11	-21.7 (4.0)	-2.7 (6.9)	0.01
Married/cohabiting	-20.4 (9.7)	-13.5 (4.4)	0.59	2.8 (2.2)	-10.4 (8.1)	0.16	-25.4 (12.7)	-21.3 (11.1)	0.81
Employment Status									
Unemployed	-20.4 (7.6)	-18.3 (6.1)	0.85	-5.1 (6.3)	11.6 (7.8)	0.11	-26.0 (6.2)	-1.0 (10.3)	0.03
Employed	-17.0 (4.6)	-11.2 (3.8)	0.39	0.2 (1.8)	-5.8 (2.8)	0.07	-18.4 (4.6)	-13.3 (4.6)	0.51

IG, intervention group; CG, control group.

* The analysis using marital or employment status contains only those control group patients randomly chosen to receive a baseline assessment.

The intervention group had fewer motor vehicle violations and arrests (Fig. 5). Only 4.7% of intervention patients and 4.8% of control patients received formal alcohol treatment after trauma center discharge, whereas 15.6% and 13.7% participated in self-help groups (Alcoholics Anonymous). This suggests that the trauma center intervention was the main source of treatment effect.

DISCUSSION

This study demonstrates that reducing trauma recidivism and subsequent hazardous drinking in trauma patients is

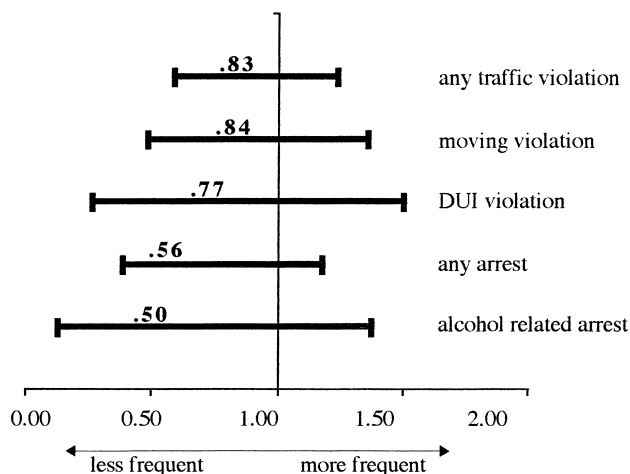


Figure 5. Odds ratio and 95% confidence interval for other outcomes at 1 year of follow-up for intervention group patients compared with controls, adjusted for SMAST, age, gender, injury severity, injury intent, and number of violations or arrests in the 6 months before injury.

possible using interventions that are consistent with the time, financial, and staffing constraints typical of a busy urban trauma center. One out of eight hospital beds in the United States is occupied by an injured patient.³² Because approximately half of these patients are injured while under the influence of alcohol, interventions coupled with trauma center admission have the potential to have a marked impact on public health.

Previous studies of brief interventions have demonstrated that a reduction in drinking in patients with mild or moderate drinking problems does not require prolonged or intensive counseling.^{11–23,33} The rationale for their use in trauma centers is based on the fact that patients with severe problems are disproportionately injured, but most injuries occur in patients with mild to moderate problems because such patients constitute the greatest proportion of problem drinkers (83%), as was noted in this study.

Patients with high SMAST scores did not appear to benefit from the intervention. Prior alcohol treatment, another potential marker for more chronic disease, was also associated with a lack of response. Paradoxically, patients who were unemployed or without the support of a spouse or partner, factors that are associated with resistance to treatment, appeared to benefit more from the intervention than patients without these adverse prognostic factors. However, the lack of difference in employed and married patients appeared to be related to a sustained postinjury reduction in drinking in both intervention and control group patients with these attributes, supporting the notion that for many patients, a severe injury alone can be a motivating factor for change that results in a decrease in alcohol use.^{17–22} At the

6-month follow-up, both intervention and control group patients demonstrated a reduction in drinking, which is also consistent with a temporary intervention effect of the injury itself. However, over time the level of drinking in control group patients increased, approaching the amount consumed at entrance into the study, whereas there was a progressive, sustained decrease in alcohol use in intervention group patients.

We were unable to detect an intervention response in female trauma patients, a population considered to be at increasing risk for alcohol-related injuries. The sharpest increase in motor vehicle crashes in recent years has been in young women with moderately elevated BACs.^{34,35} Women also have a higher risk of fatal motor vehicle crashes than men with similarly elevated BACs.³⁶ Some have suggested that women may benefit from gender-specific interventions that take into account their increased risk for primary affective disorders, marital discord or divorce, and spousal alcohol abuse.³⁷ However, the number of women in the study was relatively small, which may have biased gender-based analysis.

We believe that the intervention used in this study can be easily implemented in trauma centers. Screening with an admission BAC can be incorporated into routine admission studies performed for other purposes. The SMAST, a 13-item questionnaire, can be incorporated into trauma center admission routines with minimal expense and disruption. Finally, the intervention itself can be performed after relatively minimal training by a number of nonspecialists, including physicians, nurses, trauma care coordinators, social workers, and other trauma center staff. Lack of medical insurance for substance abuse treatment is often cited as a reason for failure to screen trauma patients for alcohol problems. However, only 32% of our study patients had medical insurance; <5% received formal alcohol treatment after trauma center discharge, whereas 15.6% participated in self-help groups (Alcoholics Anonymous) at no cost.

Another commonly cited disincentive for alcohol screening in trauma centers is that a positive result may affect insurance coverage for the hospital stay. A BAC obtained to facilitate acute management of an injury or medical condition is not protected beyond the usual boundaries of confidentiality. However, federal regulations (42 Code of Federal Regulations, Part 2) require strict protection of information obtained specifically for the diagnosis and treatment of substance abuse.³⁸ If an admission BAC is obtained for the express purpose of providing substance abuse treatment, it can be kept apart from the medical record in a separate area such as a locked cabinet, along with the results of screening questionnaires, and under federal regulations need not be disclosed to anyone except medical staff whose primary function is the provision of alcohol treatment or referral for treatment (42 CFR 2.11).

Perhaps the most important result of this study was the 47% decrease in injury recidivism that was noted in intervention group patients. Although the 95% confidence inter-

val was 0.26 to 1.07 ($p = 0.07$), taken in context with the overall findings of the study, the benefits of trauma center intervention appear to be convincing. Based on the extraordinarily high prevalence of alcohol use in injured patients, the Centers for Disease Control and Prevention has called for the development of alcohol-focused injury prevention programs, and the Department of Health's Model Trauma Care System Plan also calls for the inclusion of screening, intervention, and referral of patients with substance abuse for treatment as integral components of trauma care.³⁹ The Institute of Medicine has indicated that the responsibility to provide counseling for patients with uncomplicated cases of mild to moderate alcohol abuse or early dependence lies not with alcohol treatment specialists, but with general staff in hospital wards, such as trauma centers, who are trained to provide "brief interventions."³⁷

At present in the United States, verification of level 1 or 2 trauma center status by the American College of Surgeons requires trauma centers to offer physical, occupational, and speech therapy. Given that nearly half of our nation's trauma beds are occupied by patients injured while under the influence of alcohol, therapy for alcohol problems has been left conspicuously absent from the care of trauma patients. There are >3.6 million hospital admissions for injuries each year. The performance of alcohol interventions in trauma centers has the potential to have a major impact on the long-term health and future injury risk of such patients.

Acknowledgments

The authors thank Elizabeth Kingsley, MA, Linda Lawson, BA, Daphne Monary-Ernsdorff, BS, Jennifer Favell, PhD, Rubbina Mamdani, PhD, and Carmel Finch, BS, for their work as part of the Alcohol and Trauma Prevention Study Team, and Alan Cheadle, PhD, for his help with the data analysis.

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Discussion

DR. C. JAMES CARRICO (Dallas, Texas): I want to congratulate the group from Harborview on their outstanding work and the continuation of their address to this problem. They and others have documented the high incidence of elevated blood alcohols and other evidence of alcohol abuse in trauma patients.

They have evaluated a number of brief interventions and have proposed in their hypothesis today that such interventions would be beneficial in reducing injury recurrence. In the data they presented, they present evidence that a 30-minute intervention during the “teachable window following injury” was associated with a statistically significant decrease in alcohol consumption and a nearly 50% decrease in recurrent admissions for injury. Because of the small numbers, this did not reach statistical significance.

More importantly, they have focused our attentions on the importance of treating the real causes of injury, just as we would with any other medical problem ranging from recurrent urinary tract infections to occult GI bleeding. Just treating the injury is not sufficient. Finding the cause of the injury and trying to remedy that is what this study proposes.

I believe this report should and will generate significant enthusiasm and must generate other studies to validate the results. We also need to temper our enthusiasm with a careful analysis of the report and try to be sure that the conclusions, which we are eager to accept, are both valid and robust. In that spirit, I have some questions for Dr. Gentilello regarding the study design.

First, you collected baseline data on all your intervention patients but on only 45% of your control patients. Can you tell us why you chose that and what impact that might have had on the outcome of the study?

Second, you excluded patients under 18 years of age. I understand some of the legal concerns, but wonder why you did that, since teenagers well may be a group where interventions are most likely to be effective and most important.

The third question has to do with the change in alcohol consumption. Some of your patients decreased their alcohol intake, or at least reported decrease in their alcohol intake, as much as 20

drinks per week. How reliable is self-reported alcohol use and how much might their reporting been influenced by the fact that (after the intervention) they were aware that you were interested in alcohol use?

I think the more important questions have to do with the interpretation. The patients in your intervention group not only had decreased alcohol use, decreased trauma recidivism, but, as you pointed out in one of your slides, a significant decrease in risk-taking behavior in general. So I wonder if you have evidence that what you are seeing is a direct reflection of decreased alcohol intake or a reflection of general decrease in risk-taking behavior. You mentioned the year follow-up period. I wonder if that is long enough and if these patients need further reinforcement.

In closing, I would agree with your conclusion that, quote, “given the prevalence of alcohol problems in trauma patients, screening, intervention, and counseling for ETOH should be routine in trauma centers.” Again I congratulate you on an excellent study and would strongly encourage you to conduct a similar study in teenagers.

PRESENTER DR. LARRY M. GENTILELLO (Seattle, Washington): Thank you for your kind comments, Dr. Carrico. We performed a baseline evaluation in only 45% of controls because our intervention was brief, but the baseline assessment was lengthy. We were concerned that an extensive interview with control patients would raise their awareness of their alcohol problem, contaminating them as a control group. We performed a baseline assessment on approximately half of the controls so that we could determine if the baseline assessment itself influenced subsequent alcohol intake by comparing those with and without a baseline assessment. We found that there was no reactivity to the assessment.

We excluded patients less than 18 years of age because we currently have a grant to study brief interventions on minors who present with injuries to the emergency department, so they are being studied as a separate category. With regard to the reliability of self-report, the psychiatry and psychology literature rely upon it as a valid measure. This is based upon a number of studies which indicate that self-reports of drinking, when compared to biological markers or the reports of significant others, are both reliable and valid. The available data also does not appear to support the common assumption that alcoholics systematically underreport their alcohol consumption. When discrepancies are found, they are relatively comparable split between those in the direction of underreporting and overreporting. Based on the literature, we feel that the obtained findings of improvement in the function of patients who had received the brief intervention reflects actual changes in drinking behavior, not just a difference in self-report.

We took additional steps to enhance the validity of self-reports. Patients were not informed that they were entering an alcohol intervention study. Consent was only obtained for use of medical records and other databases, and for follow-up interviews to assess their overall recovery from trauma. Patients were not aware that they were participating in an alcohol intervention trial. The alcohol counselor entered the patient's room in the same way that any professional staff would, and conducted the intervention as a routine component of trauma care. The connection between study participation and the subsequent receipt of alcohol counseling was transparent. As an additional measure to enhance validity of self-report, research staff performing follow-up were blinded to the patient's group assignment.

Finally, Dr. Carrico, you asked if the results were a direct effect

of a reduction in risk-taking behaviors, such as DUIs, arrests, *et cetera*, rather than a reduction in alcohol intake. My answer to that question is that the change in high-risk behaviors appeared related to the reduction in drinking, because they did not occur in the control group. As to whether or not 1-year follow-up is long enough, that is a frequent standard used in the alcoholism treatment literature to assess drinking outcomes. Alcohol intake at 1 year is an acceptable surrogate marker for alcohol intake at later periods. In addition, we assessed trauma recidivism using a statewide hospital discharge database with a follow-up duration of up to 3 years.

DR. GEORGE F. SHELDON (Chapel Hill, North Carolina): I enjoyed the paper. I had some of the same questions as Dr. Carrico. This represents a maturing of the field of trauma surgery in that it extends the responsibility for those taking care of the patients beyond the surgical intervention. I find it remarkable that a 30-minute intervention in the course of getting over an injury will result in a 47% decrease in further alcoholism or injuries. I hope that observation holds up as studies of this nature go forward.

Specifically, was there any police intervention which might have reinforced the intervention? In other words, did having somebody come by from the police department in addition to the counselor, have anything to do with reinforcing the fact that alcohol-related driving is an event that is not condoned by society?

How many of these people actually got DWIs, lost their license, and really couldn't put themselves at risk because they couldn't drive in the period following the event?

Finally, the important point that has been raised is, what is the appropriate follow-up period? Also, the fact that you had a number that had other types of substance abuse issues—did they simply move to another substance abuse from alcohol as part of their dealing with this particular situation?

DR. GENTILELLO: Dr. Sheldon expressed surprise that a 30-minute intervention would result in such a dramatic reduction in injuries, and that is very understandable. However, these were not simply 30-minute talks with an alcohol counselor. They were highly structured “brief interventions” consisting of six essential elements, with the content and approach varying according to the severity of the patient's alcohol problem. Still, we are not proposing that we have a cure for alcoholism by virtue of a 30-minute counseling session. Alcoholism is a chronic condition characterized by relapse. The intervention capitalized on the motivating effects of the injury, which resulted in a change in outcome when compared to controls, and that appeared to last for the study duration period. As with most chronic diseases, many or most patients will eventually relapse. If an intervention is performed by the trauma team at each relapse event, the overall effect may be a significant reduction in cumulative drinking amount by the patients over a given period of time.

As to whether or not there was a role for police interventions, there is actually a negative association between trauma center admission and being arrested. In other words, if you get into an accident while you are intoxicated and are taken to a trauma center, it dramatically reduces your chances of being arrested. So police department interventions played no role here.

With respect to the question that patients may have received a DUI citation and lost their license, and were therefore not at risk for recidivism because they could not drive during the follow-up period, we would not expect that to bias the study because whether

or not the police department issued a DUI citation should affect both control and intervention groups equally.

You also asked a question about the appropriate follow-up period. As I mentioned, 1 year is considered an adequate follow-up period in the alcohol literature, as it is predictive of longer-term alcohol intake. Nevertheless, given the chronicity of alcoholism, we are not expecting that intervention group patients will never relapse. We hope that when they do, screening, intervention, and counseling will again be made available to them.

As to whether or not patients simply switched from alcohol use to drug use, the intervention addressed concurrent drug abuse, because many of these patients have a dual drug abuse disorder. Whatever the source of the treatment effect was, I believe it was strong enough to allow us to recommend trauma center interventions as a routine practice, particularly since our findings replicate many other studies which have demonstrated that brief interventions are effective in a variety of other inpatient and outpatient hospital settings.

DR. DAVID B. HOYT (San Diego, California): Dr. Gentilello, I would like to congratulate you on an excellent study. I would also like to congratulate the Program Committee for selecting this paper. I think this represents true recognition of the importance of prevention and prevention-related research by one of the most important organizations in American medicine. And although it is not the first, it is the beginning of the endorsement of prospective clinical trials in prevention, that is, evidence-based prevention research. The study demonstrates that a simple, easily done intervention will change critical behavior.

I would have to say that I was really skeptical regarding the value of this kind of intervention. It seems so relatively small in the context of everything else that is going on with these patients. I would also have to admit I have been wrong. We now have prospective randomized data about trauma patients and alcohol intervention in behavior change. It seems to work.

We need to apply this important study and implement its conclusions. Should we wait for it to be published? Should this now in fact be required at trauma centers undergoing verification and designation? I don't know the answer to this question, but my gut feeling says yes. Certainly, at the very least this study will start to lead the discussions to determine the importance of programmatic factors such as this in our overall responsibility to our patients.

Dr. Gentilello, I have three straightforward questions:

We know that the patient population that you evaluated also has mild to moderate clinical depression which lasts at least 18 months. Have you assessed whether depression of patients who are able to successfully limit drinking, relative to controls, is less?

Have you extended this to all your patients based on your study? What is the actual resource increase that you require to do this? Is this done by a dedicated person? Do the trauma physicians do this? Do the nurses do this? Just who does this on an ongoing basis?

Finally, although you alluded to the reason for this, I would like you to expand on it. Why do you think there is little difference in drinking behavior at 6 months but then develops at 12 months? Can you speculate as to how to explain that difference?

DR. GENTILELLO: Thank you for your generous comments, Dr. Hoyt. We have data on depression. It was not included as a part of this study, which primarily focused on alcohol intake and trauma recidivism.

As to whether or not we have extended this program to all of our

patients, the answer is yes. We have hired an alcohol counselor specifically trained in the brief intervention approach, who functions as a member of the trauma team and performs the intervention as a routine component of care.

What resources are required to implement a brief intervention program? Very few. Screening can be accomplished by simply adding an admission blood alcohol concentration to admission labs. As an alternative, one can simply administer the 13-item Short Michigan Alcoholism Screening Questionnaire, or the 4-item CAGE Questionnaire. Both of these instruments can be kept separate from the medical record. Hiring the counselor is equivalent to hiring one more nurse or one more physical or occupational therapist. Also, this counseling is billable under current CPT codes, so it may actually pay for itself.

Why there was no difference in alcohol intake at 6 months, but a major reduction at 12 months? There are two possible reasons. First, for the first 6 months, many patients may still have been recovering from their injuries, and were unable to drink as much as before. Second—and this is the reason that I believe—is that injury itself has a major impact on the patient that often reduces their drinking for a period of time. I base that opinion on a number of studies that have documented that alcohol-related injuries motivate patients to reduce or stop their drinking. The additional effect of the intervention was apparent because it capitalized on this effect, and further increased the patient's motivation and commitment to change.

DR. TIMOTHY G. BUCHMAN (St. Louis, Missouri): Dr. Gentilello, a wonderful paper. And I would like to pursue the first of Dr. Hoyt's comments. Alcohol remains the most prominently used—not the most commonly prescribed, but the most commonly used—drug in the United States as treatment for anxiety/depression. The hypothesis that Dr. Hoyt alludes to is that in fact this is not alcoholism but alcohol used as treatment for depression which precipitates the injury.

Do you have data on the number of your patients, or the fraction of your patients, who initiated antidepressant therapy or antidepressant medication in the postinjury period? And is it possible that the 30-minute intervention triggered those patients to seek additional therapy for underlying depressive symptoms?

DR. GENTILELLO: Dr. Buchman, thank you for your comments. It is very difficult to separate alcoholism from depression. Alcoholism is one of the leading causes for depression. When faced with a depressed, alcoholic patient, it is standard practice to address the alcohol problem first. Only after a significant period of sobriety has elapsed can the patient be assessed for endogenous depression. In many or perhaps most cases, the elimination of alcohol leads to cessation of the depression.

So, it is very difficult to answer this because depression is an integral part of the syndrome of alcoholism. I can say that less than 5% of our patients received any formal alcohol treatment from a health care professional after trauma center discharge, so it is unlikely that they subsequently visited a therapist who provided psychiatric treatment for depression.

DR. JOHN TERBLANCHE (Cape Town, South Africa): We recently completed a survey of motor vehicle accidents, both pedestrians and drivers, in the Cape Town Trauma Unit. Very high blood alcohol levels were found in close to 90% of both groups. I wonder whether you may have less indigent patients in Seattle with a 50%

intoxication incidence—I suspect this may be different in other parts of the U.S.A. where there may be a higher indigent population.

My question relates to your success with counseling. Over many years, I have tried to counsel alcoholic cirrhotic and pancreatitis patients. However, we have been remarkably unsuccessful with any kind of counseling. Why are trauma patients different? We will certainly look at counseling in our Trauma Unit.

DR. GENTILELLO: Dr. Terblanche, the reason why alcohol interventions have limited effectiveness in cirrhotic or pancreatitis patients is generally because no one addressed the underlying alcohol problem while it was still treatable. The goal of brief interventions is to address alcohol problems early, by focusing on those who can be characterized as being at the stage where they have alcohol abuse only, or who have only mild to moderate forms of dependence.

Most patients who are cirrhotic have been seen by doctors dozens and dozens of times without receiving any form of screen-

ing, intervention, and counseling. To step in after their disease has become end-stage and expect to easily turn it around is quite unrealistic. It is like treating metastatic cancer at that point.

DR. KEITH A. KELLY (Scottsdale, Arizona): Could you generalize your results to other psychiatric illnesses besides alcohol and depression in dealing with trauma patients? Would there be other psychiatric illnesses that might underlie trauma that would also be amenable to intervention and so prevent recidivism in them?

DR. GENTILELLO: Dr. Kelly, that is a very worthwhile consideration. One illness that comes to mind is posttraumatic stress disorder as a cause of subsequent injury. It has been shown that such patients have increased levels of depression, anger outbursts, and poor self-control. The role of PTSD is being investigated by others, and is an important area that needs to be addressed in injury prevention programs. There are a number of treatable risk factors for injuries. We chose to address alcoholism in our study, however, because it is by far the leading cause of injuries.